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THIN ELK FORMATION, LOWER PLIOCENE, SOUTH DAKOTA

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CONTENTS

ILLUSTRATIONS

TABLE

THIN ELK FORMATION, LOWER PLIOCENE, SOUTH DAKOTA

by
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INTRODUCTION

Discontinuous deposits of the Miocene-Pliocene Ogallala Group occur across southern South Dakota from Pine Ridge (Harksen, 1967) to Wessington Springs (Green, 1965) (fig. 1). The Ogallala Group in South Dakota consists of deposits of fluvial origin that were deposited by late Miocene and early Pliocene streams flowing eastward from the Black Hills and Rocky Mountains. In this paper one lithologic unit within the Ogallala Group is designated as a new formation.

PREVIOUS INVESTIGATIONS

In the past many names have been applied to the Ogallala Group in South Dakota; some of these are: Rosebud Formation (Perisho and Visher, 1912); Oak Creek Formation (Troxell, 1916); Bijou Formation (Stevenson and Carlson, 1950); Ash Hollow Formation, Valentine Formation (Agnew, 1958); Pliocene ? Gravels (Agnew, 1963); and Burge Member, Cap Rock Member, Devils Gulch Member (Skinner *et al*, 1968).

The Ogallala Group in South Dakota has yielded three major vertebrate local faunae: Big Spring Canyon (Gregory, 1942), Wolf Creek (Green, 1956), and Mission (Macdonald, 1960). All of these faunae are of late Clarendonian age which seems to indicate that most of the Ogallala in South Dakota is a lower Ash Hollow equivalent.

The name "Hisle gravel" was applied to Ogallala deposits in Bennett, Custer, Mellette, Todd, and Washabaugh Counties, South Dakota by Sevon (MS) who used the name in a dissertation. Although no formal proposal for the name has ever been made and it has no official standing, Sevon must be credited with having recognized these deposits as having a lithology distinct from the remainder of the Ogallala in the area.

THIN ELK FORMATION (new name)

The Thin Elk Formation of the Ogallala Group is here named for exposures in the Joe Thin Elk gravel pit in sec. 35, T. 40 N., R. 28 W., Mellette County, South Dakota (figs. 2 and 3). This name is proposed as a formal stratigraphic name in accordance with the Code of Stratigraphic Nomenclature (American Commission on Stratigraphic Nomenclature, 1961). The name has been cleared through the Geologic Names Committee of the United States Geological Survey.

The earliest use of the name Thin Elk is by Schultz and Falkenbach (1941) who refer to material collected by Morris Skinner and party from the "Joe Thin Elk Gravel Pits." Macdonald (1969) also refers to the site as Joe Thin Elk Gravel Pit. While these usages have no validity within the Code of Stratigraphic Nomenclature the writers considered these precedents when choosing the name Thin Elk Formation.

In selecting a type section for a geologic unit where there are two (or more) possible localities available, the writers believe that one containing a fauna to which an age can be assigned, is the best choice for the type section. In selecting a locality for the type section of the Thin Elk Formation, the one from which the Mission local fauna was obtained seems to be logical. It furnishes a lithologic base plus an age assignment determined by its faunal content. An age determination is desirable because it seems that several cycles of cut and fill may be represented within the Ogallala of South Dakota.

Lithology

The headwaters of the river system which deposited the Thin Elk Formation were in the

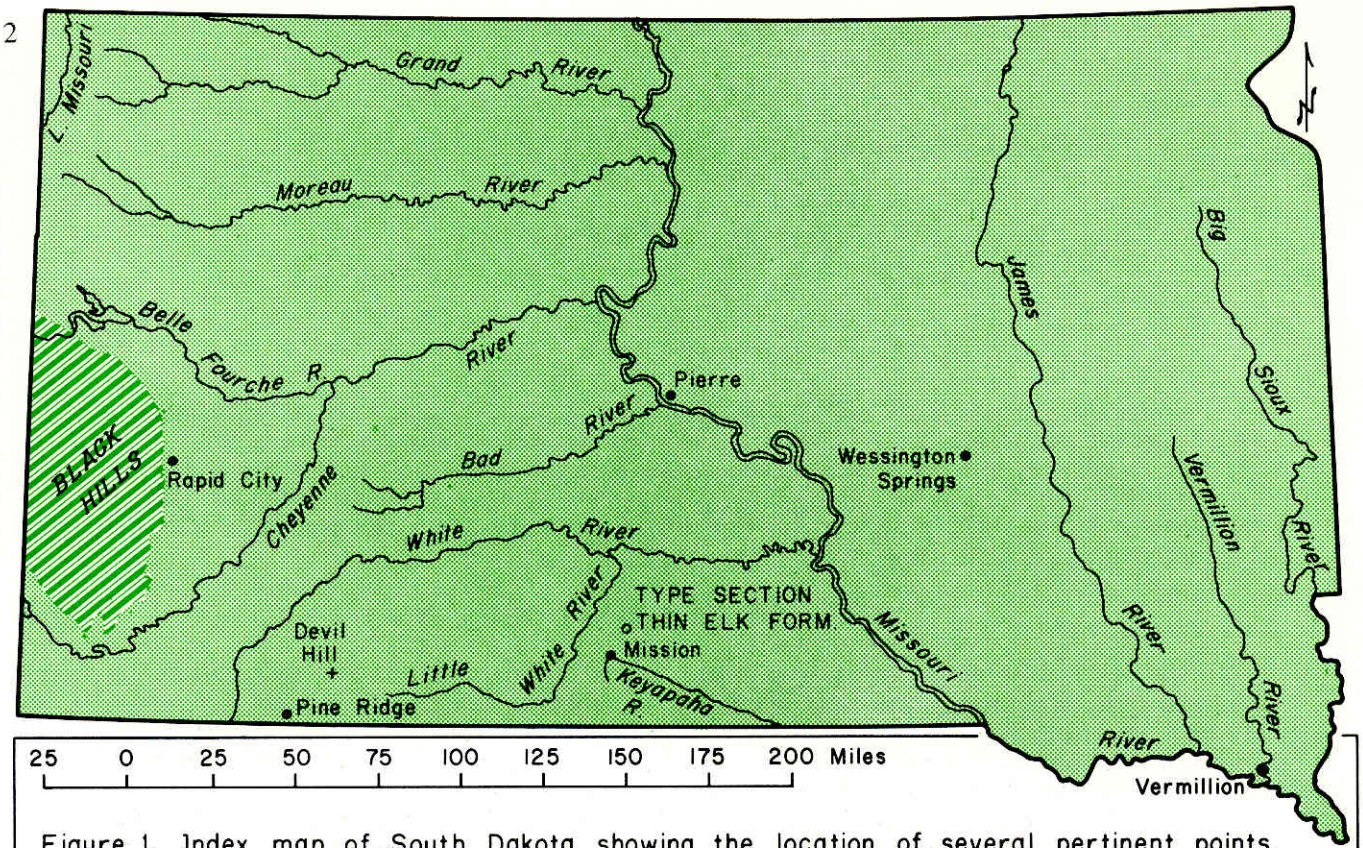


Figure 1. Index map of South Dakota showing the location of several pertinent points.

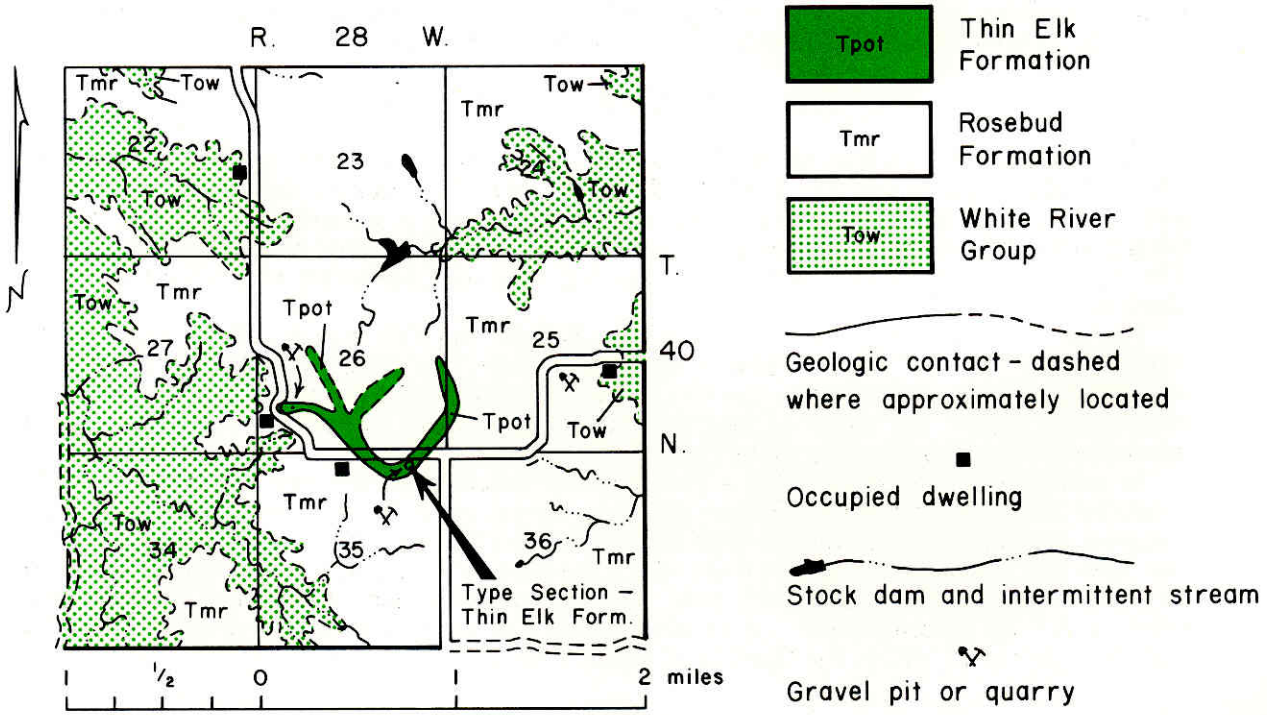


Figure 2. Geologic map of the type area for the Thin Elk Formation of the Ogallala Group (modified from Agnew, 1963).

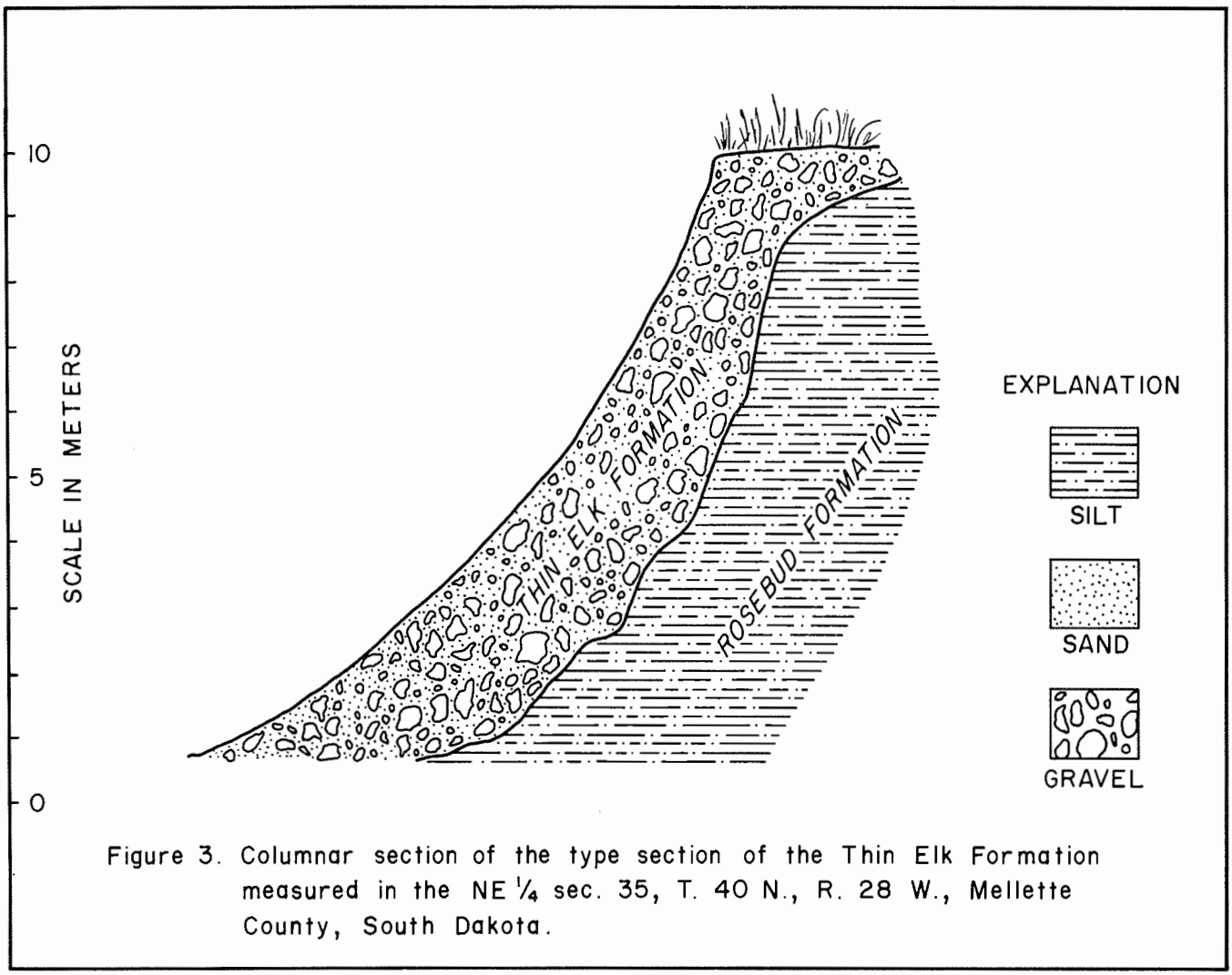


Figure 3. Columnar section of the type section of the Thin Elk Formation measured in the NE ¼ sec. 35, T. 40 N., R. 28 W., Mellette County, South Dakota.

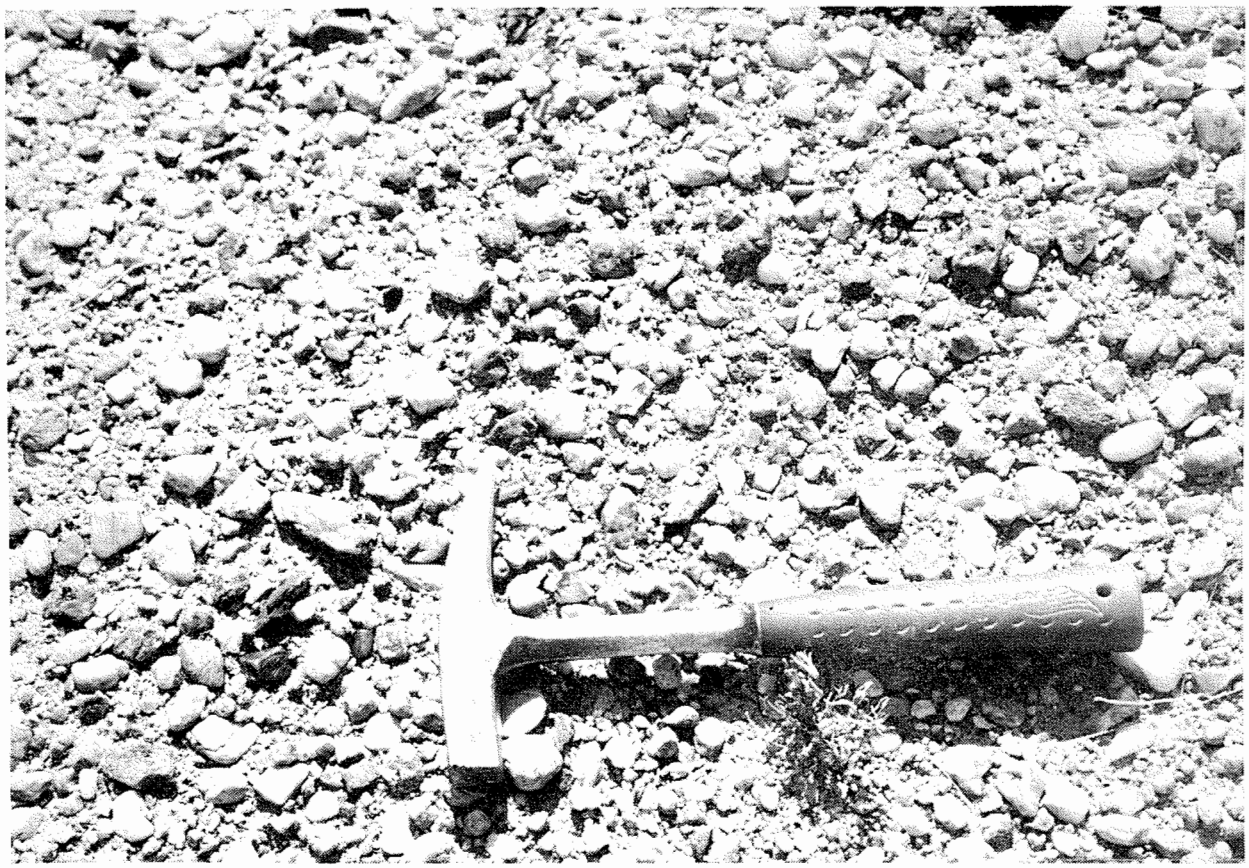
Black Hills (fig. 1). Minerals peculiar to the southern Black Hills are present in abundance; most notable are pebbles of quartz and feldspar derived from the pegmatite dikes of the southern Black Hills. The heaviest rock of Black Hills origin found at the type area was a pebble of quartz which weighed 227 grams.

At the type locality, the Thin Elk Formation is a yellowish to brownish sand and gravel (fig. 4), usually unconsolidated, containing minor amounts of volcanic ash. Placers of garnets are common and cemented ledge-forming lenses are present near the top of the unit. Blocks of limestone weighing an estimated 50 kilos and locally derived from the underlying Rosebud Formation are also incorporated within the Thin Elk Formation. Because the stream which deposited the Thin Elk Formation flowed across geologic units ranging in age from Precambrian to Miocene, the rock composition is quite varied.

Geologic Relationships

The Thin Elk Formation at the type locality is a deposit from a stream which cut down into the Rosebud Formation (early middle Miocene) (figs. 2, 3, and 5). The Rosebud Formation consists of a pink clayey silt with many randomly spaced shards of volcanic ash. Where typically developed the Rosebud contains many small tubular holes which apparently are paleo-root holes. Limestone beds are also present at various horizons within the Rosebud Formation. The base of the Thin Elk Formation is defined as that point where its yellowish sand and gravel is in contact with the underlying pink silt. A list of the fossils from the type locality and other localities is presented in table 1.

Figure 4. Typical lithology of the Thin Elk Formation. Taken at the type locality in the NE¼ sec. 35, T. 40 N., R. 28 W., Mellette County. Eleven inch geology pick for scale.



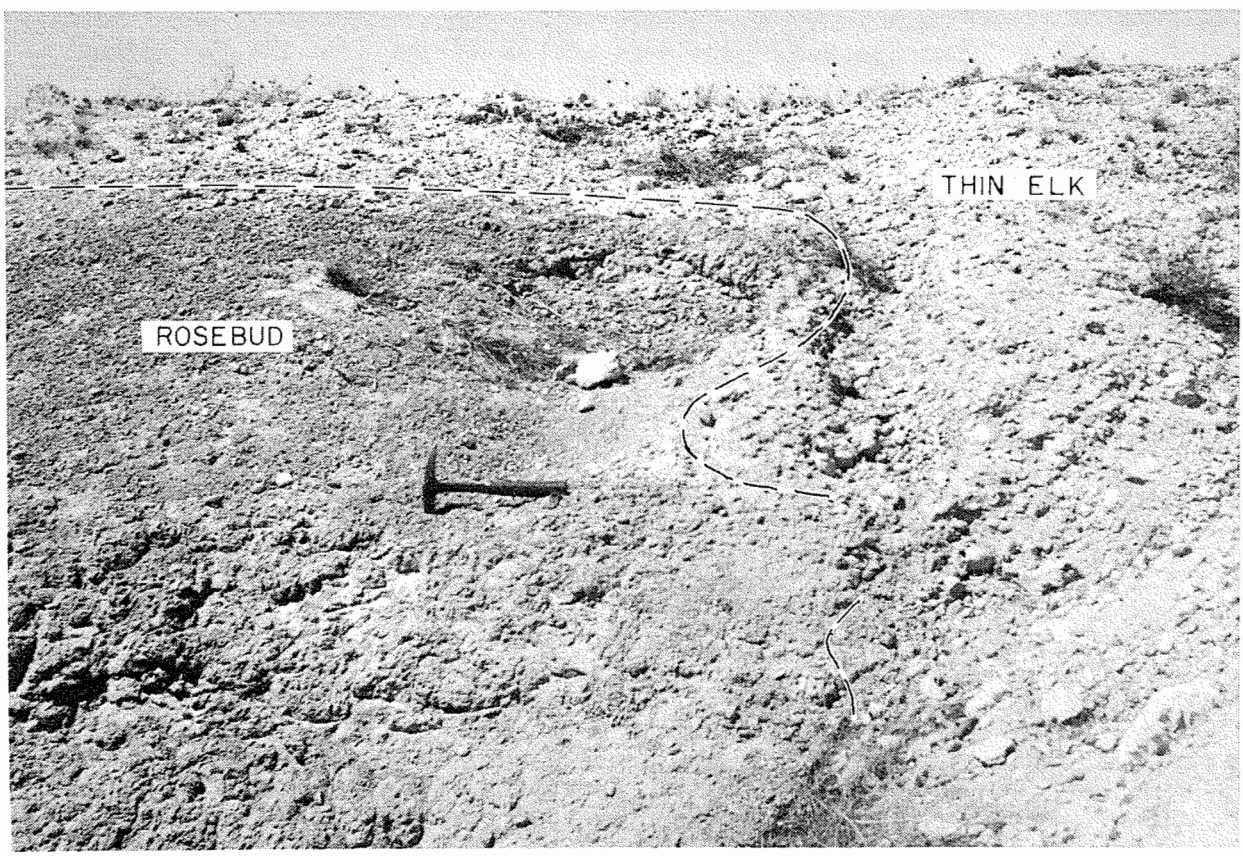


Figure 5. The Rosebud and Thin Elk Formations at the type locality for the Thin Elk Formation. Eleven inch geology pick for scale.

Table 1.

	MUSEUM OF GEOLOGY FOSSIL VERTEBRATE LOCALITIES																	
FAUNAL ELEMENT	V5314	V573	V574	V575	V603	V604	V605	V607	V608	V6013	V6016	V6018	V6019	V6020	V6021	V6024	V691	V695
INSECTIVORA																		
Soricidae	X																	
LAGOMORPHA																		
Hypolagus	X																	
RODENTIA																		
Mylagaulus	X																	
Protospermophilus	X																	
Citellus	X																	
Perognathus	X																	
Cupidinimus	X																	
Eucastor	X																X	
Plesiosminthus	X																	
CARNIVORA			X															
Canidae		X											X					
Tomarctos	X																	
Aelurodon	X																	
Ischyrocyon	X																	
PROBOSCIDEA																		
Gomphotherium	X						X	X										X
PERISSODACTYLA																		
Equidae													X					
Hypohippus	X																	X
Neohipparion	X		X	X	X	X	X	X				X					X	X
Pliohippus	X	X	X	X					X	X						X	X	X
Astrohippus	X																	
Pseudhipparion	X			X	X		X	X	X	X	X	X			X	X	X	X
Tapiridae																		
Tapirus	X																	X
Rhinocerotidae						X		X										
Teleoceras	X																	X
ARTIODACTYLA																		
Tayassuidae																		
Prosthennops	X							X										
Merycoidodontidae																		
Ustatochoerus	X																	X
Camelidae		X		X		X	X	X	X			X		X		X		X
Protolabis	X																	
Procamelus	X																	
Pliauchenia	X																	
Paracamelus	X																	
Palaeomerycidae																		X
Antilocapridae																		
Merycodus	X												X	X				X

Mammalian faunal elements collected from the Thin Elk Formation of South Dakota and housed at the Museum of Geology of the South Dakota School of Mines and Technology. The locations of these collecting sites are:
V5314, sec. 35, T. 40 N., R. 28 W., Mellette County (the type section for the Thin Elk Formation);
V573, sec. 32, T. 39 N., R. 29 W., Todd County;
V574, sec. 23, T. 39 N., R. 30 W., Todd County;
V575, sec. 22, T. 39 N., R. 30 W., Todd County;
V603, sec. 23, T. 39 N., R. 30 W., Todd County;
V604, sec. 32, T. 39 N., R. 29 W., Todd County;
V605, sec. 24, T. 39 N., R. 30 W., Todd County;
V607, sec. 34, T. 39 N., R. 29 W., Todd County;
V608, sec. 22, T. 39 N., R. 30 W., Todd County;
V6013, sec. 36, T. 39 N., R. 30 W., Todd County;
V6016, sec. 21, T. 39 N., R. 29 W., Todd County;
V6018, sec. 12, T. 38 N., R. 30 W., Todd County;
V6019, sec. 32, T. 39 N., R. 29 W., Todd County;
V6020, sec. 34, T. 39 N., R. 29 W., Todd County;
V6021, sec. 36, T. 39 N., R. 30 W., Todd County;
V6024, sec. 22, T. 39 N., R. 30 W., Todd County;
V691, sec. 22, T. 38 N., R. 30 W., Todd County;
V695, sec. 13, T. 37 N., R. 36 W., Bennett County.

Geographical Distribution

Exposures of the Thin Elk Formation are found from the type section westward to the vicinity of Devil Hill [Rattlesnake Butte] (fig. 1). Some of the exposures which have yielded vertebrate fossils are listed in table 1, and give an estimate of the general areal distribution of the formation. While some doubt could be expressed as to whether all of these isolated deposits are referable to the Thin Elk Formation, we believe that their lithic similarity plus the fossil content is sufficient basis for our conclusions.

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